

Socio- economic and Environmental Determinants of Filariasis in Matara District of Sri Lanka

G. Edirisinghe *

Senior Lecturer, Department of Geography University of Ruhuna Matara, Sri Lanka.

Email: olta.ruh@gmail.com, edi@geo.ruh.ac.lk

Abstract

Filaria is a parasite disease which causes everlasting mental and physical suffering to the affected. The World Health Organization declared Sri Lanka as a country which wiped out filariasis from the land in the year 2016. However, the incidents of filarial are still reporting and causes to spread the disease have not being resolved yet. Therefore, the present study which was conducted in the year 2015 is serve as a case for identification of social, economic and environment factors that largely contributes to spread the filariasis disease. The study includes both primary and secondary data. Primary data was collected from a sample of 70 families to represent 20% of the patients out of 350 that have been identified during the period from year 2000- 2015 in the district of Matara in Sri Lanka. The main objective of the study was to identify the root causes for the filariasis and to perform statistical analysis for the selected stratified sample. The factors considered in this study include population density, age group, gender, low land areas, hydro areas, swamp, barren land and garbage disposal. It was revealed that there was positive relationship among those factors and filariasis disease.

Keywords: Environment; Filariasis; Correlation; Socio- economic.

1. Introduction

Although filariasis is not a deadly disease, it is a parasitic disease which causes lifelong mental and physical suffering to the patients who are victimized. Meantime, it has been created many socio -economic problems and issues around the world. Therefore it is considered as a disease that leads to paralyze their lives forever [1]. Filariasis is considered as a mosquito borne parasitic disease, which damages the lymphatic system of human beings and creates health problems especially in tropical and sub-tropical countries.

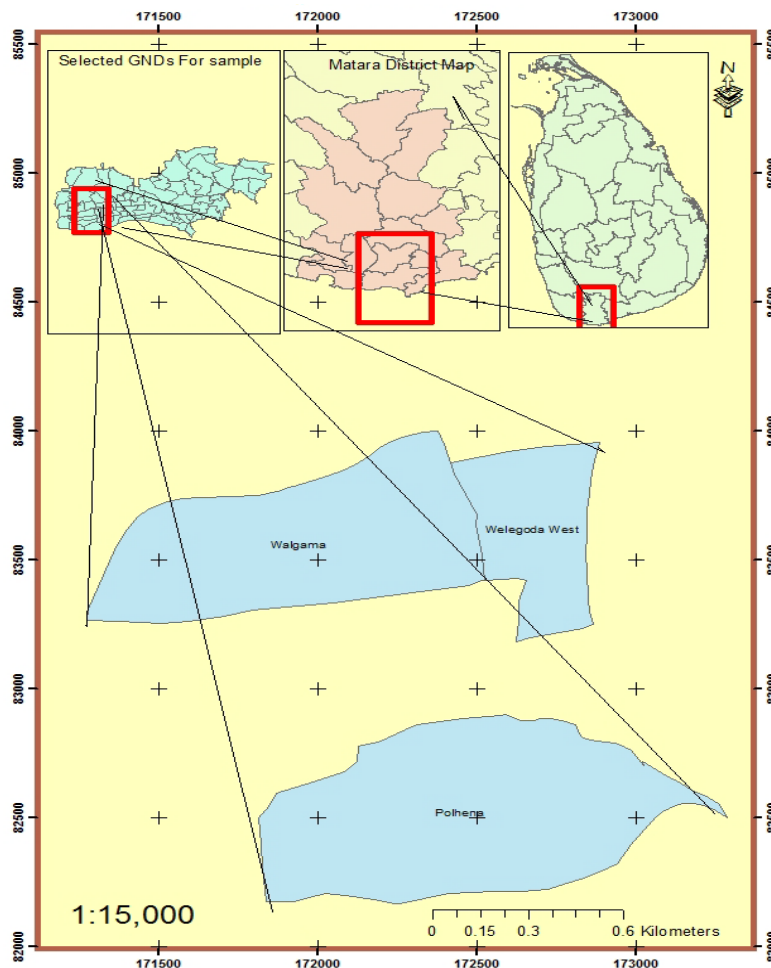
* Corresponding author.

Climatic and environmental factors prevailing in the zones seem to create a better environment for the spread of the disease. As per the recent estimation at global level, over 120 million people have been victimized by the disease. Out of them, more than 40 million have been affected severely [2]. People who are living in the countries such as Asia, Africa, and Pacific Island are most vulnerable to this disease and are suffering considerably from the disease. According to the World Health Organization estimation, 20% of world population live in 80 countries including Sri Lanka is suffering from the disease at the moment. The disease kills an estimated 534,000 people worldwide every year [3]. Filariasis is caused by the most harmful parasite nematodes in humans. It can be defined as a mosquito borne parasite disease, which damages the lymphatic system of human beings. This disease has been identified as a major health problem especially in tropical countries [4]. Sri Lanka has been experienced that disease during the 12th and 13th centuries as a result of Kalingamaga invasion [5]. The *Brugia Malayi* which was called as the rural type had spread along the South Western Coastal belt of Sri Lanka during the decade of 1960 [5]. It was revealed that the African troops who employed in Galle and Matara districts of south coast of Sri Lanka were the root causes for the spread of the disease. Therefore, it was evidenced that the expansion of the disease in Sri Lanka has been commenced after the foreign invasions. Therefore, it is affirmed that the expansion of colonization and thereby trading too contributed significantly to spread the disease throughout the globe. Colonization was intensified in the sixteenth and seventeenth centuries and its effects during nineteenth to twentieth centuries contributed to increasing trading from and to the west. Later on, during the 1970s, trade liberalization expanded through Western European countries including the United Kingdom (UK) and the USA. Those attempts of trade liberalization have made huge impacts on the economic globalization process throughout the world [6]. Accordingly, the colonization, liberal economics and finally the globalization process has considerably contributed to spread the disease in Sri Lanka as well. Following basic requirements has been identified as causes for spreading of the vector. (a) optimal temperature and humidity, (b) high population density with high proportion of micro filarial carrier and (c) heavy breeding *Culex fatigans* due to the presence of natural and artificial habitat and ecological niches [7]. It was recorded that there had been significant changes in the distribution of filariasis in Sri Lanka during the twentieth century. Filariasis is considered as a parasite disease which causes lifelong mental and physical suffering to the affected which mainly prevails in the coastal belt in Sri Lanka [8]. Accordingly, it was further reveals about the existence of *Brugia Malayi* in many parts of Sri Lanka. The first reported case of filariasis was found from the Central province of Sri Lanka in the year 1939. Three patients were identified from Matale, Kandy and Matara hospitals at that time. The *Brugia Malayi* which was called as the rural type, had spread along the south western coast. There had been an expansion of the rural type for the Northwards of Chilaw, Puttalam and Kurunegala [7]. Further research has identified new foci of infection in Sri Lanka especially in the Mahaweli System C and Kirindi Oya irrigation schemes [9]. Lymphatic Filariasis is a vector borne disease caused by the parasite *Wuchereria Banorofti*, which lives usually in the lymphatic system of a person [10]. Many studies have evaluated the economic impact of the chronic manifestations of Lymphatic Filaria infection for both estimated financial losses and the loss of a number of work days [11]. Living in a rural environment was associated with higher compliance in several studies [12] Sri Lanka received the Certification on Elimination of Lymphatic Filariasis on 21 st of July 2016 from the World Health Organization as Sri Lanka has successfully brought down the microfilaria rate to less than 1% [11]. However the impact of the disease in the country and more especially to the south coastal areas including the study locations is still high. Therefore,

the present research has been conducted to find out and explain socio-economic and environment factors which contributes to spread the filariasis.

2. Materials and Methods

The study was conducted in the Matara Divisional Secretariat Division (DSD), in Southern province of Sri Lanka. Matara district is comprised with 16 DSDs and eight out of sixteen divisions are critically affected by the threats of filariasis. Matara DSD is the most affected area among them. There are 66 *Grama Niladhari* Divisions (GND) in Matara DSD. Figure 1 shows the study area and 350 filariasis patients are reported during the study period. This study has selected 20% of those patients representing 70 patients in the sample. Primary data was gathered using questionnaires. Secondary data has been used to explain the disease, its gravity and reasons for its spread. Data analysis was done using Arc GIS 10.1 software and Micro Soft Excel. Geo processing analysis has also done for the purpose of examining the locations, attributes and relationship of features in data by using overlay and other analytical techniques in order to gain useful knowledge. The location of filariasis patients are then analyzed in order to find out the spatial patterns and the spatial relationships with other factors. The key socio-economic parameters analyzed in the study include correlation between filarial cases and population density, hydro areas, low land areas, home gardens, coconut gardens and other socio economic factors such as the age and gender.



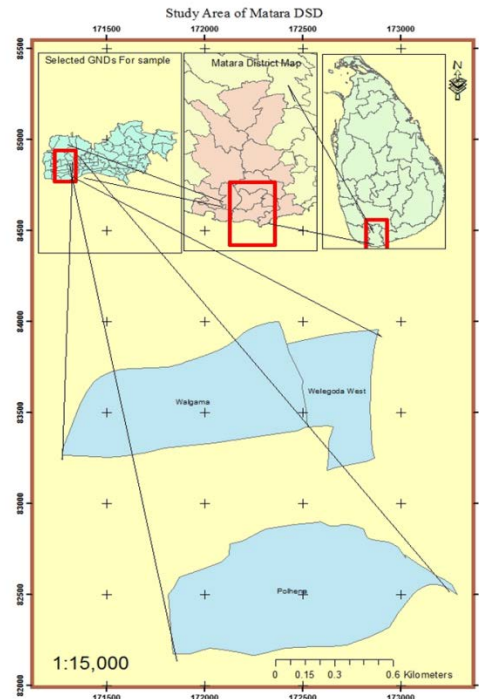


Figure 1: Study area Matara Divisional Seretariat Division in Matara District(MDSD)

Source: prepared by the author

3. Findings and discussion

Filaria had been a main public health problem around few decades ago. Although Sri Lanka has successfully brought down the rate, filaria patients are still there. Accordingly, 350 cases were recognized in the study location. Geographically, the highest number of patients were reported from *Polhena* GND area and the lowest number of patients were reported from *Diyagaha* west GND. The second highest number of patients numbering to 34 were recorded from *Madiha* GND area. Figure 2 and 3 show relationship between the filariasis patients' locations and population density. 14 out of 66 GNDs have been identified as the highest population density area in Matara District Seretariat Division (MDSD) and 95 cases were found from those 14 GNDs. Therefore, it reveals that when the population density increases the number of filaria patients are also increase. Accordingly, the high population density creates many socio-environment problems in the areas. Lack of sanitary facilities, irregular maintenance of drainage systems, garbage dumping are the main issues of these areas. Therefore such environments encourage to create mosquitoes breeding sites and they help vector mosquitoes to transmit the epidemic throughout the area. According to the figure 2 filaria patients were rarely found from the low population density areas. Correlation between filaria and the population density is recorded as R value 0.0101 and the p value 0.609 depicting a slightly positive relationship between population density and filaria.

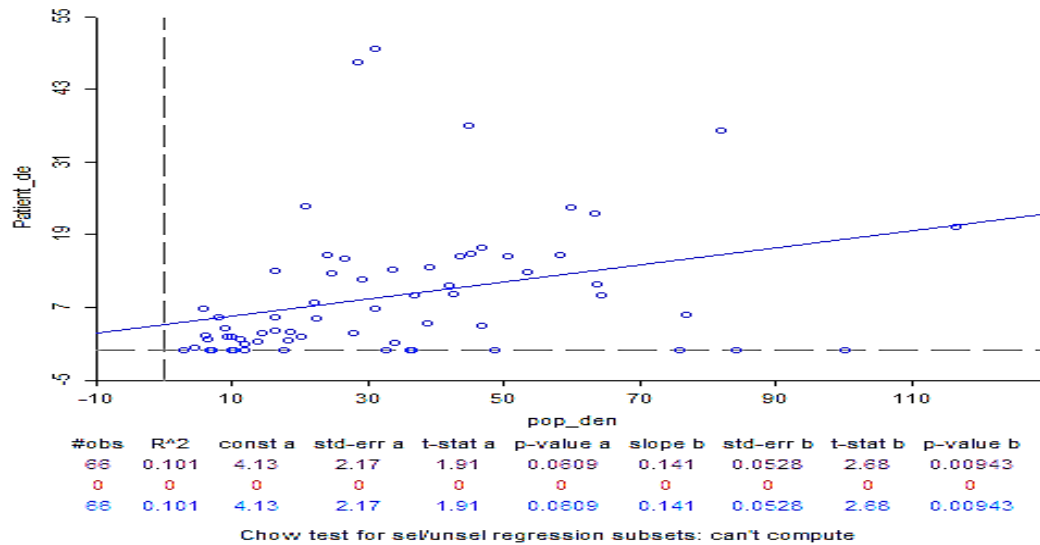


Figure 2: Correlation between filarial cases and population density

Source; Author's sample study data, 2015

The data on figure -02 clearly illustrates the correlation between filarial cases and population density. Accordingly, there was very high number of filarial cases in highly populated areas when compared with the low density areas of the study location. Meantime, a spatial auto correlation analysis was also done in order to identify the correlation between these two variables for further clarity.

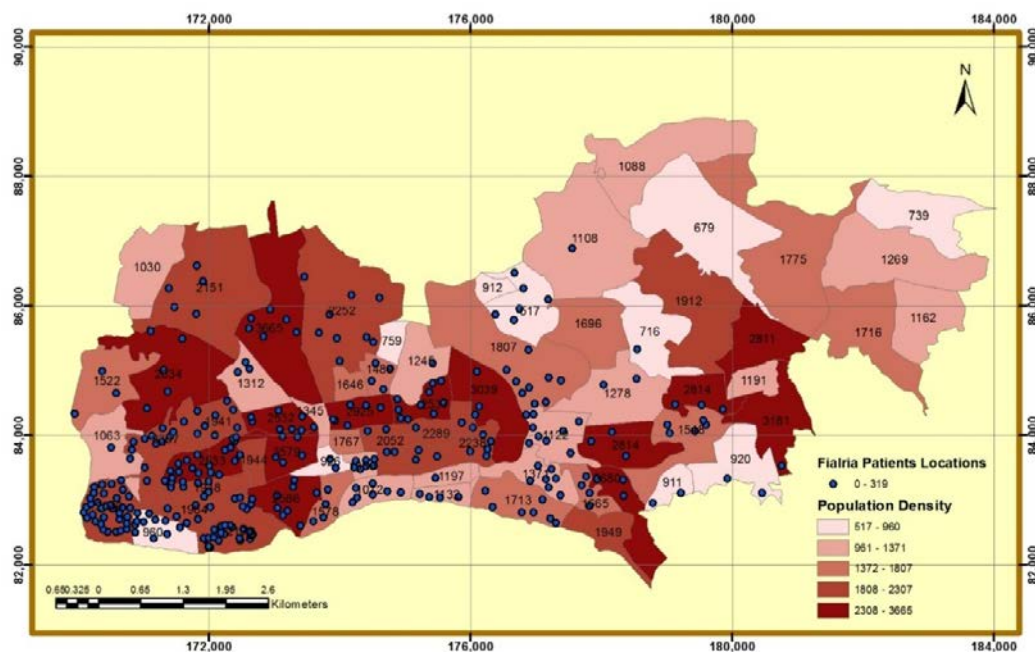


Figure 3: Spatial distribution of relationship between the filarial cases and population density

Source: Author's sample study data, 2015

3.1. Filariasis hotspots; the Hydro areas

Spatial auto correlation reports were applied to find out filariasis high risk areas with the use of hotspot analysis; hotspot analysis with statistical significant spatial of high values. According to the figure 4 and figure 5, the density of the patients was high around the hydro areas when compare with other areas. Even the history proves that the people usually gathered around stream lines particularly to earn their living by farming and other human activities. On the other hand these streams create a friendly environment to form the mosquito breeding sites. At the same time, human activities of these areas are reported to be in the process of directly strengthening the threat of the risk areas.



Figure 4: High vulnerable filaria areas in MDSD

Source: Author's sample study data, 2015

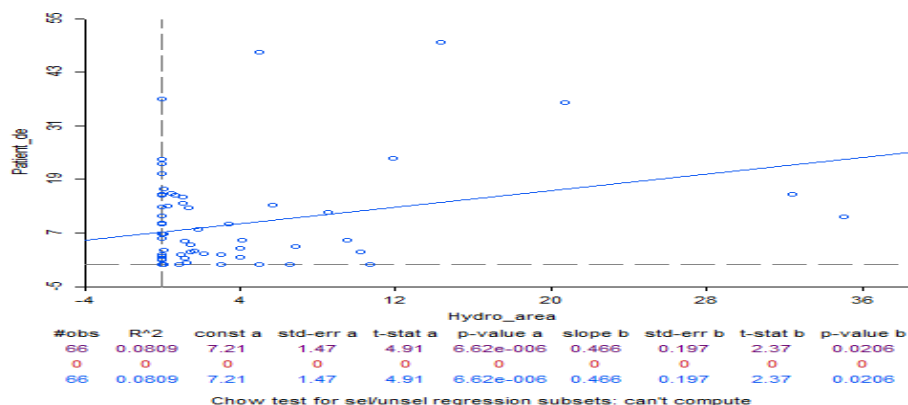


Figure 5: Correlation between hydro areas and the filarial location

Source: Author's sample study data, 2015

3.2. Relationship between filarial cases and beaches & low slope areas

Terrain lands with slope areas are critical factors in determining the availability of filarial. Figure 6 and 7 depict that there was a direct relationship between filarial and sand beach areas. Most of patients recorded from the coastal areas such as *Polhena, Madiha* and *Walgama* DSDs and they were marked as the areas of high risk. Most of the land areas were home gardens and highly populated. Figure 8 shows correlation between the main cultivation and filarial in the areas especially home gardens and filarial with high density. There was a positive correlation between filariasis with home garden in which R value is 0.130 and P value is 0.349. The major plantation in these areas was coconut cultivation. Thus the researcher was compelled to identify the relationship between the distribution pattern of the filarial and the land use of the area. Correlation between coconut lands and the filarial was analyzed in figure 9. On the other hand the observations revealed that there was a relationship between the coconut industry and the disease at the early stage but it reveals that the above factor does not encourage in spreading the disease at present.

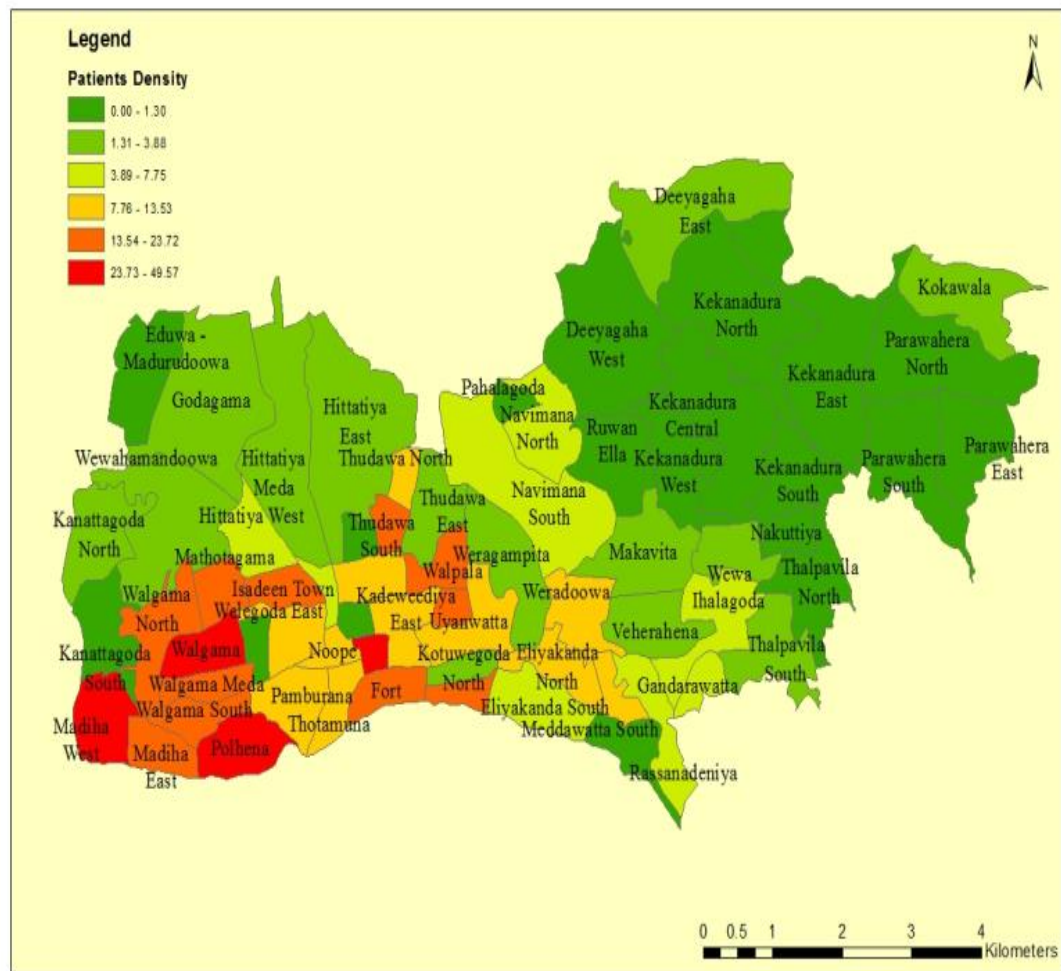


Figure 6: High density Filaria areas in the MDSD

Source: Prepared by the Author

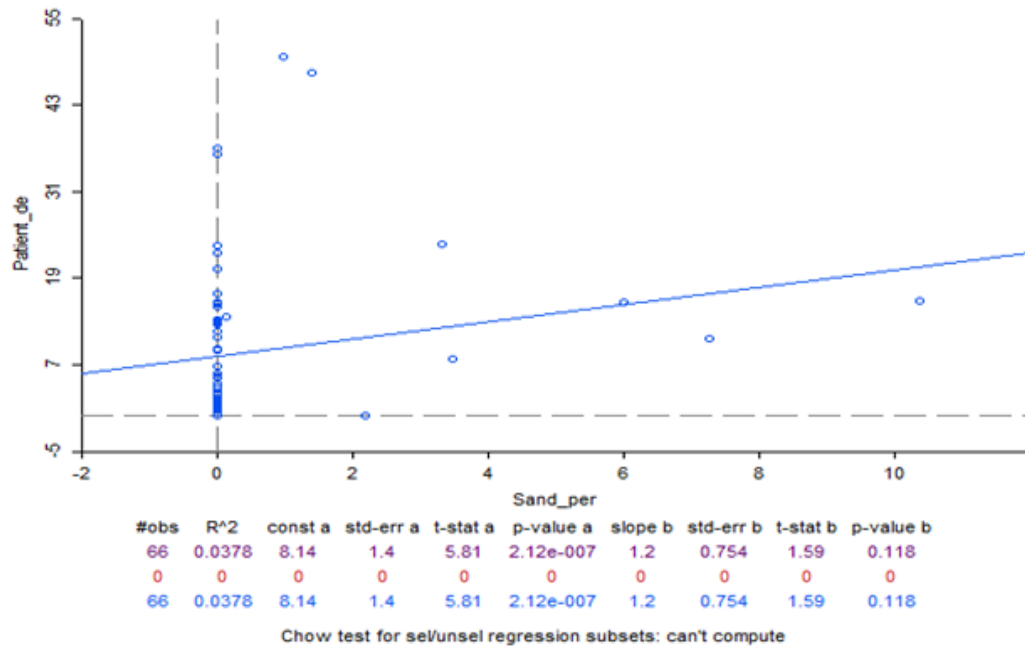


Figure 7: Correlation between the Sand beaches and filariasis in MDSD

Source: Author's sample study data, 2015

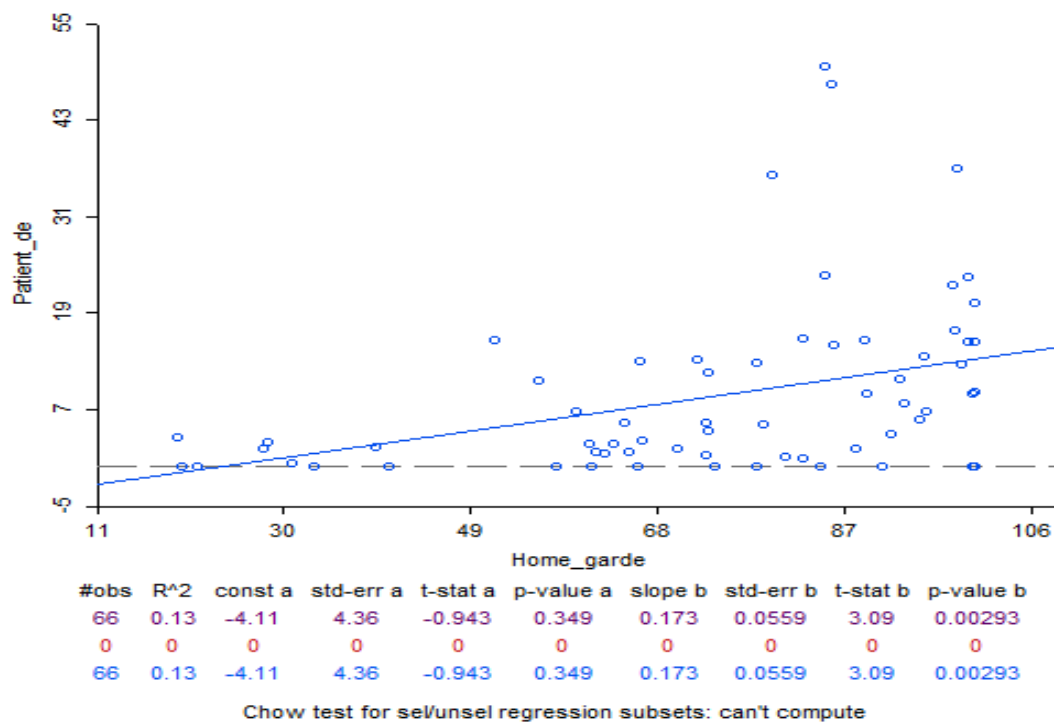


Figure 8: Correlation between home garden and the filariasis in MDSD

Source: Author's sample study data, 2015

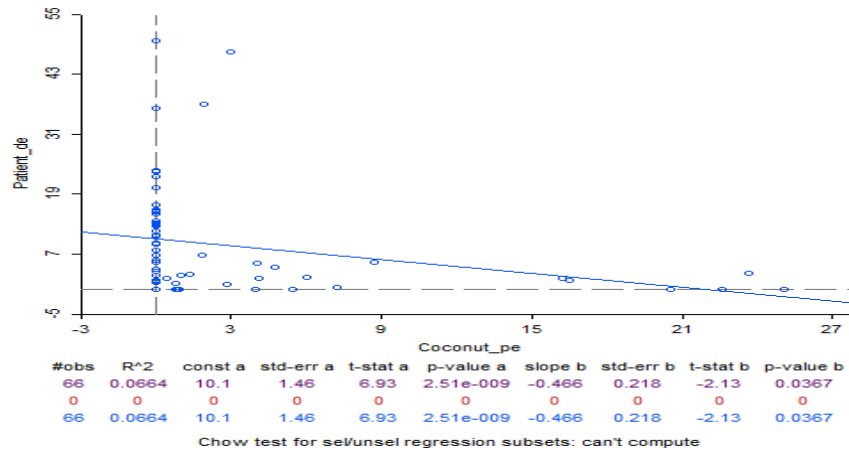


Figure 9: Correlation between coconut gardens and filariasis MSDS

Source: Author's sample study data, 2015

Accordingly, the study found that there are very high correlation between the human activities of cultivation, livelihoods, residency and spread of filaria disease.

3.3. Contribution of marshy lands to spread filariasis

The study found that there were swamps and marshy lands in the study area with less population density. Although, there is a possibility to grow mosquitos in marshy lands, they were treated as low risk areas. It was revealed that there wasn't a significant relationship between marshy lands and filaria. In other lands such as paddy and barren lands also didn't depict any correlation with filarial. Figure 10 shows the correlation between Marshy lands and filariasis in MSDS

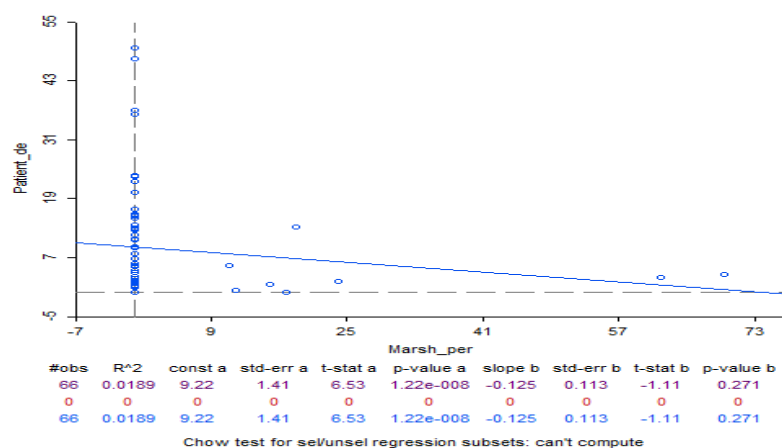


Figure 10: correlation between Marshy lands and filariasis

Source: Author's sample study data, 2015

3.4. Effect of other socio economic factors for the existence of filariasis

Further to the thematic areas already explained in this paper, factors such as gender, age, income level, built up lands, lack of drainage maintenance system, lack of garbage removal process in the study area were also investigated. There, the study revealed that the human activities of the area have been severely contributed towards the spread of the filaria. During the period from year 2000 to 2015 the majority of the patients who were infected by filaria were men when compared with women. Percentage wise it was around 65% of males and 35% of females. When compare about the age factor, the highest total number of filaria victimised people were over 60 years old and percentage wise it was 76%. Filariasis in MDSD has a long history because patients have been victimised at the young age and had suffered more than half of their life time. Figure 11 shows the correlation between the patients over 60, and filariasis in the study area.

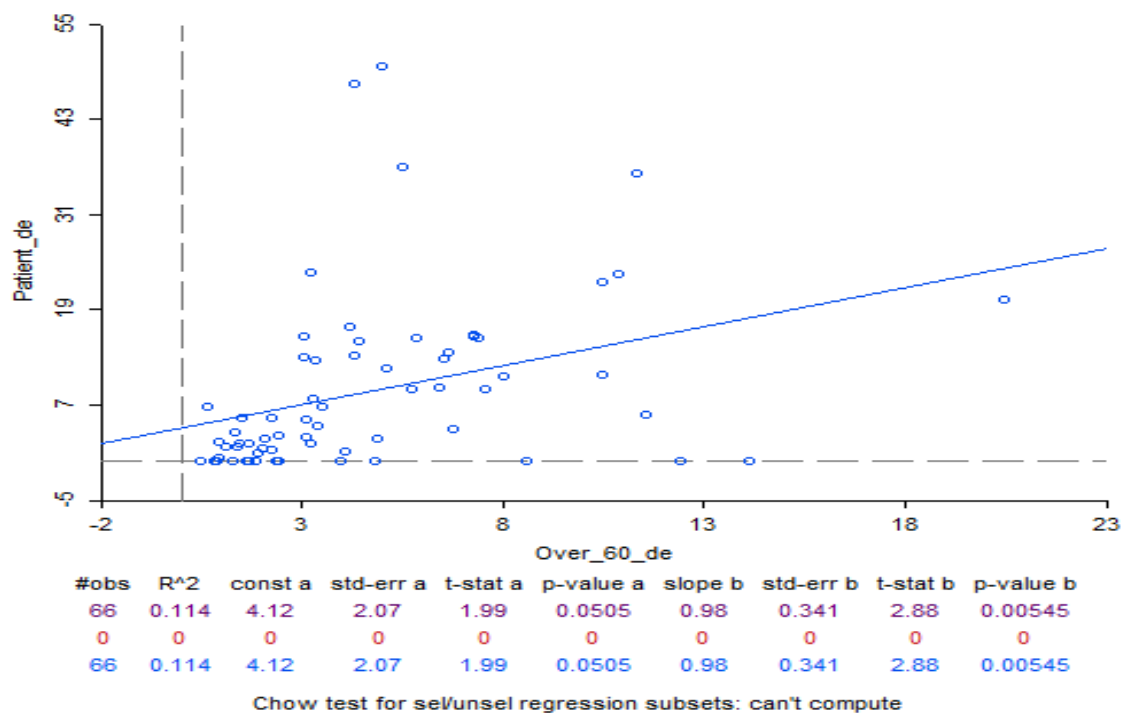


Figure 11: Correlation between over 60 years patients and filariasis

Source: Author's sample study data, 2015

The male patients who were reported more than female patients were mostly engaged in outdoor activities including cleaning the fields. It was also found that they have never used mosquito nets. Therefore they usually exposed to the environment and become victims of filariasis.

It can be identified as a strong positive relationship between male patients and filariasis with $R^2=0.115$ and p value 0.080. The correlation between female patients and the filariasis also shows a positive relationship of $R=0.0863$, P value 0.041. Figure 12 and 13 has presented correlation of filariasis and male, female population in the study location.

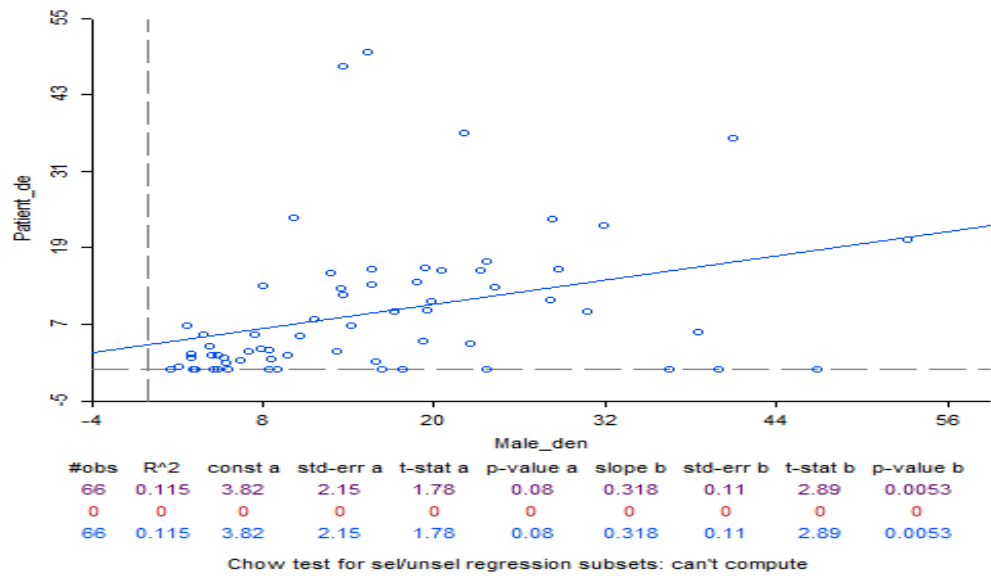


Figure 12: Correlation between the male patients and the filariasis

Source: Author's sample study data, 2015

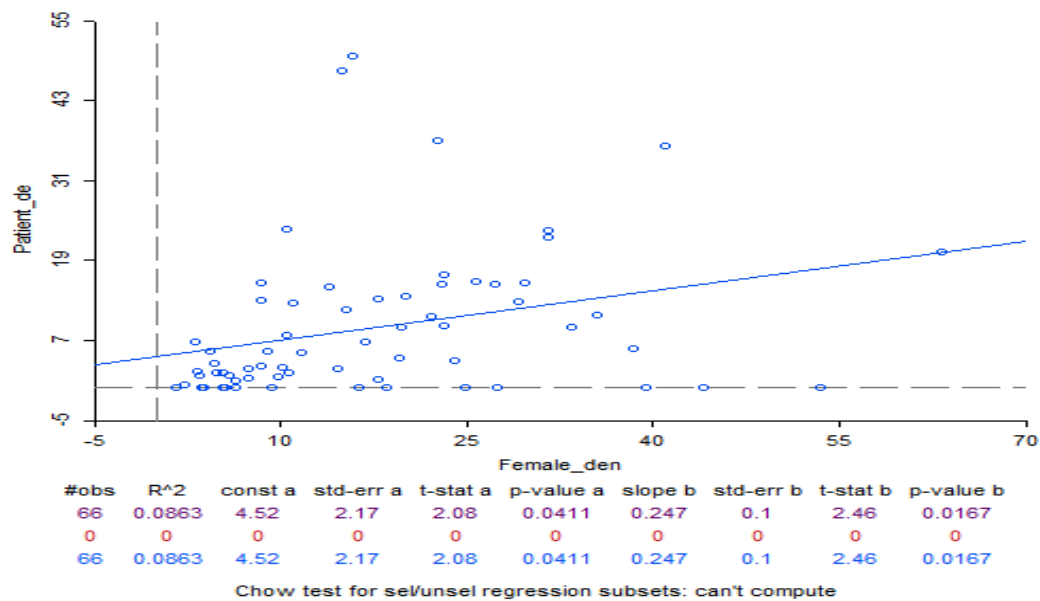


Figure 13: Correlation between the male patients and the filariasis

Source: Author's sample study data, 2015

The study found that construction of buildings, canals, drainage and ponds have been largely contributed for the vector breeding mosquitoes. Lack of proper garbage removal systems, inefficiency in maintaining drainage systems and human activities are the root causes for the spreading of filarial disease. Due to the rapid urbanization, people are compelled to move into the urban areas and it paves the way to create urban planning

and constructions. At the sametime this process creates many health hazards due to the lack of sanitary facilities, improper garbage removal systems, and so on. Figure 14 shows the correlation between builtup land areas and filiariasis.

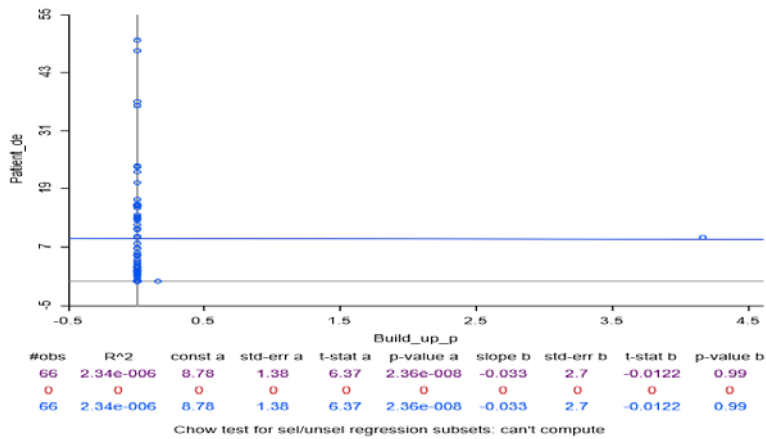


Figure 14: Correlation between builtup land areas and filiariasis

Source: Author's sample study data, 2015

3.5. Summary of findings

Figure15 illustrate summary of the correlation analysis. It gives a comprehensive knowledge regarding both human and envirnmental factors contributed for the distribution of the disease. The study found that there was a direct relationship between the socio economic and enviroenment factors discussed in this paper and the spread of the disease. It was also foud that there is high posibility to spread the filaraisis among elder people than the younger generation. Meantime, the majority of patients founds were males than females. However, it was witnessed that the effectes of environmental factors were expited by the human factors towards the distribution of the disease in the study area.

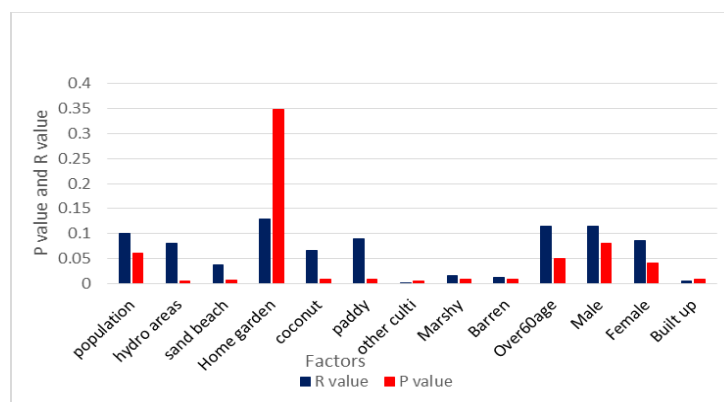


Figure 15: Summary of the correlation factors contributes to filiariasis disease

Source: Author's sample study data, 2015

4. Conclusion

As per the findings of the study, it was identified that the coastal areas of low land beaches have high possibility to spread filariasis disease. Most of the people in the filariasis affected areas don't have sufficient understanding about the filariasis. Lack of awareness is also caused for the spread of the disease. Local residents are unaware about reasons for the distribution and the methods to prevent. Patients those who are infected by the disease haven't get proper treatment at the correct time due to the unawareness of the disease. The study revealed that the human activities of the area have been severely contributed towards the transmission of the disease. Accordingly, it can be concluded that population density, swamp barren land, methods of garbage disposal significantly contributes to spread the filarial disease. The analysis reveals that more males are victimized when compared with females and, as such 65% filariasis patients in the study area were males while only 35% was females. Although the filariasis is not a deadly disease, it causes to filarial mental and physical hazards. Although the disease usually neglected by the society, patients personal lives are paralyzed forever and thereby create many social issues. Therefore, it is important to plan public health services properly even considering the environmental factors. It is worth to be taken proactive measures than reactive measures in preventing the disease.

References

- [1]. Centers for Disease Control and Prevention. Neglected Tropical Diseases. 2011; Available at: <http://www.cdc.gov/globalhealth/ntd/diseases/index.html> (February, 2017).
- [2]. World Health Organization. Global programme to eliminate lymphatic filariasis: progress report 2014. Weekly epidemiologic record. 2015 ;(90) pp.:489–504.
- [3]. K.D. Ramaiah, P.K. Das, E. Michael, H. Guyatt. The economic burden of lymphatic filariasis in India. Parasite Today 2000; 16: pp.251-253.
- [4]. World Health Organization. Lymphatic filariasis: managing morbidity and preventing disability: an aide-memoire for national programme managers. Geneva, Switzerland: World Health Organization; 2013.
- [5]. M.H.M. Abdul Cader and M. Sasa Epidemiology and control of Bancroftian Filariasis in Ceylon Japanese Journal of Experimental Medicine (1996) Vol 6,609-646
- [6].U. Pannilage. Globalisation and Construction of Local Culture in Rural Sri Lanka. Sociology Study 6(7) , pp 448-461, July 2016.
- [7].U. Schweinfurth. Filarial Diseases in Ceylon: A geographic and historical analysis, Ecology of Disease, 2 (4) pp 309-319, 1983.
- [8].W.A.D.S. Wanasinghe and R.M.K. Rathnayake. Health Implications of Urban Expansion: A Medico

Geographical Study of the Distribution of filariasis in the City of Colombo, Printed Ann. Res.Ses. FGS, 1998. pp 103-105

- [9]. A.S. Dissanayake. Filariasis in Ceylon then (1961) and Sri Lanka Now (1990-30 years on) Annual Journal of Tropical Medicine and Parasitology, Vol 8 pp123-129, 1991.
- [10]. S. Dissanayake and J. Nalini Bancorftian Filariasis in Sri Lanka: An Overview of Current Knowledge, Journal of National Science Council Sri Lanka . 17(2) pp141-160, 1989.
- [11]. Anti-filarial Campaign Report, Ministry of Health, Sri Lanka, 2016.
- [12]. B.V. Babu , B.K. Swain,K. Rath K. Impact of chronic lymphatic filariasis on quantity and quality of productive work among weavers in an endemic village from India. Tropical medicine & international health: TM & IH. 11(5):712–717, 2006.
- [13]. B. Babu and S.K. Kar. Coverage, compliance and some operational issues of mass drug administration during the programme to eliminate lymphatic filariasis in Orissa, India. Trop Med Int Health , 4 (9): pp 702–709, 2004.
- [14]. Anti-filarial Campaign Report (2000-2012) Medical Health Office, Matara District, Sri Lanka, 2013.